



COVID-19 vaccine: Psychological impact in a Portuguese sample

Vacina COVID-19: Impacto Psicológico numa amostra Portuguesa

Vacuna COVID-19: impacto psicológico en una muestra portuguesa

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ABSTRACT

Objective: The present study sought to evaluate the psychological impact of the COVID-19 vaccination in a Portuguese sample. **Methods:** A cross-sectional study was conducted by 921 participants who filled an online questionnaire. The online self-report questionnaire was made up of questions ranging from socio-demographic information, Generalized Anxiety Disorder scale items and general anxiety levels. This study was carried out in Portugal from October to December 2020. All participants gave their voluntary and informed consent to participate in the study. **Results:** Most of the participants reported mild to severe anxiety symptoms. The highest levels of anxiety were reported by 59.6% of participants who reported “very/extremely” general anxiety symptoms and 39.1% were of the same opinion regarding anxiety symptoms in relation to the COVID-19 vaccine. There was a positive correlation between the anxiety score (GAD-7) and the level of anxiety related to vaccine availability (P1, $r_s = .18$, $p = <.001$, in P2, $r_s = .27$, $p = <.001$ and in P3, $r_s = .31$, $p = <.001$). **Conclusion:** This study showed a moderate prevalence of generalized anxiety symptoms about COVID-19 vaccines in a Portuguese sample, with a tendency to increase when approaching vaccination decision making. Therefore, ensuring that the population is informed about COVID-19 vaccines could reduce unnecessary anxiety, improve behavior, health/wellbeing, and decision-making.

Descriptors: COVID-19; Vaccine; Anxiety; Mental Health.

RESUMO

Objetivo: O presente estudo procurou avaliar os níveis de ansiedade associados ao processo de vacinação COVID-19 numa amostra portuguesa. **Métodos:** Foi desenvolvido um estudo transversal, com 921 participantes que preencheram um questionário online. O questionário de auto-relato era constituído por perguntas do âmbito sócio-demográfico, itens da escala de transtorno de ansiedade (GAD-7) e perguntas gerais sobre ansiedade percebida. Este estudo foi realizado em Portugal, entre outubro e Dezembro de 2020. Todos os participantes apresentaram o seu consentimento voluntário e informado para participar no estudo. **Resultados:** A maioria dos participantes relatou sintomas de ansiedade leves a graves. Os níveis de ansiedade relatados foram semelhantes em termos de ansiedade geral sentida em relação à doença e ansiedade associada à disponibilidade e eficácia de uma vacina. Os níveis mais altos de ansiedade foram relatados durante o período entre Outubro e Dezembro, em que 59.6% dos participantes reportaram sintomas de ansiedade geral “muito/extremamente elevados” e 39.1% foram da mesma opinião relativamente aos sintomas de ansiedade em relação à vacina COVID-19. Verificou-se uma correlação positiva entre o score de ansiedade (GAD-7) e o nível de ansiedade relacionado com a disponibilização de vacinas (P1, $r_s = .18$, $p = <.001$, P2, $r_s = .27$, $p = <.001$ e P3, $r_s = .31$, $p = <.001$). **Conclusão:** Este estudo apresentou uma prevalência moderada de sintomas de ansiedade generalizada sobre as vacinas COVID-19, numa amostra portuguesa, com tendência a aumentar quando se aborda a tomada de decisão sobre vacinação.



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Portanto, garantir a informação da população sobre as vacinas COVID-19, pode reduzir a ansiedade, melhorar o comportamento, saúde/bem-estar e a tomada de decisão.

Descritores: COVID-19; Vacina; Ansiedade; Saúde Mental.

RESUMEN

Objetivo: El presente estudio buscó evaluar los niveles de ansiedad asociados al proceso de vacunación COVID-19 en una muestra portuguesa. **Métodos:** Fue desarrollado un estudio transversal, con 921 participantes que rellenaron un cuestionario en línea. El cuestionario de auto-informe fue constituido por preguntas del ámbito socio-demográfico, elementos de la escala de trastorno de ansiedad (GAD-7) y preguntas generales sobre ansiedad percibida. Este estudio fue realizado en Portugal, entre Octubre y Diciembre de 2020. Todos los participantes presentaron su permiso voluntario e informado para participar del estudio. **Resultados:** La mayor parte de los participantes informó síntomas de ansiedad leves a graves. Los niveles de ansiedad informados fueron semejantes en términos de ansiedad general sentida en relación a la enfermedad y ansiedad asociada a la disponibilidad y eficiencia de una vacuna. Los niveles más altos de ansiedad fueron informados entre Octubre y Diciembre, en que 59.6% de los participantes reportaron síntomas de ansiedad general “mucho/extremadamente elevados” y 39.1% fueron de la misma opinión relativa a los síntomas de ansiedad en relación a la vacuna COVID-19. Fue verificada una correlación positiva entre el score de ansiedad (GAD-7) y el nivel de ansiedad relacionado con la disponibilidad de vacuna ($P1, r_s = .18, p = <.001$, $P2, r_s = .27, p = <.001$ e $P3, r_s = .31, p = <.001$). **Conclusión:** Este estudio presentó una prevalencia moderada de síntomas de ansiedad generalizada sobre las vacunas COVID-19, en una muestra portuguesa, con tendencia a aumentar cuando se trata de la tomada de decisión sobre vacunación. Por lo tanto, garantizar la información de la población sobre las vacunas COVID-19, puede reducir la ansiedad, mejorar el comportamiento, salud/bienestar y la tomada de decisión.

Descritores: COVID-19; Vacuna; Ansiedad; Salud Mental.

INTRODUCTION

COVID-19 disease has exponentially spread across the world, with high rates of infection and death. The impact of the pandemic went beyond the implications for health, economic, and social levels. But of course, health, which conditions our physical and mental well-being, has been extensively studied and the search for a solution has advanced scientific developments, as never before seen. The efforts for developing a vaccine that would allow minimizing the effects of the pandemic have reached unprecedented levels of scientific progress. Due to technological development, the rapid increase of knowledge has allowed the vaccines' development with new manufacturing methodologies and in record time⁽¹⁾. However, issues have been raised about the safety and efficacy of these vaccines among the population. These reasons condition vaccine adherence and this is a global problem. In this case, we refer to the grounds that condition vaccination against COVID-19, but which are also the reasons that condition vaccine adherence in relation to other diseases⁽²⁻⁵⁾. Consequently, the rapid development of the COVID-19 vaccines seems to be associated with the highest percentage of non-adherence, conditioning decision-making. As widely shown by previous research, our decisions are often conditioned by our knowledge and physical and mental well-being⁽⁶⁾.

At present, there has been an increase in anxiety and behavior related to COVID-19 treatment, as expected in the present situation⁽⁷⁾. Anxiety is an emotion characterized by apprehension and somatic symptoms of tension in which an individual anticipates impending danger⁽⁸⁾. Anxiety is a typical response to any stressful agent and may be adaptive for the individual, such as motivating proper protecting behavioral changes (i.e. washing hands or avoiding crowds were highly recommended behaviours during this pandemic)^(6, 9, 10).

Nevertheless, this increased anxiety may become excessive for some individuals, possibly leading to the development of a mental disorder, a critical stress level that can trigger other pathologies, change behaviors, and condition people to make decisions, such as adherence to the vaccination plan^(7, 11).

In previous pandemics, worry and anxiety have typically been high^(12, 13). However, nowadays, many other factors have the potential to exponentiate the response of the population. For example, media coverage and the frequent exposure to misinformation about the emerging health threat of COVID-19 may influence anxiety and the risk perceptions related to the new vaccine development^(12, 13).

Studies about COVID-19 vaccination acceptance in different countries show that the general acceptance appears to be conditioned^(14, 15). For example, a study showed an evident vaccine hesitancy for 26% and 25% of Irish and UK samples, respectively⁽¹⁴⁾. Likewise, in other study, 64.72% of the participants reported interest in accepting the

COVID-19 vaccines if available⁽¹⁵⁾. In general, it is important to know the vaccine's perception and acceptance, especially when designing the health policy strategies or the initiatives to promote vaccine acceptance throughout the population.

Since each society has its complex interplay involving various beliefs in health and illness, it is vital to study specific social contexts and how anxiety might trigger mental health problems. Knowing and analysing anxiety levels will help decision-makers manage this crisis during the vaccination stage the best possible way. This knowledge is essential to outlining strategies that enhance the improvement of mental health and support the implementation of healthy behaviors regarding vaccination.

In this way, we proposed this study to explore the levels of a particular type of anxiety, not at the general anxiety levels in the face of the current pandemic^(7,9,11,16), but the anxiety levels associated with the COVID-19 vaccination process in a Portuguese sample.

METHODS

A cross-sectional study was conducted to explore the Portuguese citizens' anxiety levels concerning the development, availability, and adhesion to COVID-19 vaccines, using a Portuguese sample.

All participants gave their voluntary and informed consent to participate in the study and answered the questions on an online platform (Qualtrics), which automatically saved the anonymized responses in a password-protected database.

The survey was composed of 20 questions ranging from socio-demographic information, the GAD-7 items, and general anxiety levels (about prevalent COVID-19 diseases and COVID-19 vaccines). Before being made available, the questionnaire developed was validated by the senior researcher's panel and, only then was it transferred to Qualtrics software. The Qualtrics version of the instrument was validated again by a different panel to ensure it was comprehensive and user-friendly. The survey was available from October 26 to December 11 2020 and participants were expected to take about 5 minutes to fill it in.

The online platform Qualtrics TM software (Provo, UT, USA) was chosen as it was considered safe for data storage, easiness to create and distribute, according to the recommendations on social distance. Only the study's main author could access the raw data, thereby maintaining the confidentiality of research subjects and research data^(17,18).

The 7-item Generalized Anxiety Disorder Scale (GAD-7) is a common instrument reported in the literature to evaluate anxiety levels⁽¹⁹⁻²¹⁾. Each item is scored on a four-point Likert scale: "not at all" response was scored as zero, "several days" response was scored as 1, "more than half the days" response was scored as 2, and "everyday" response was scored as 3. Seven questions are related to the respondents' feelings during the two weeks prior to the filling in of the questionnaire. A maximum score of 21 was regarded as the highest level of anxiety, while zero was considered the lowest level. A GAD-7 scale total score of 0–4 indicates no anxiety, 5–9 indicates mild anxiety, 10–14 indicates moderate anxiety, and a score of 15 or higher indicates severe anxiety⁽¹⁹⁻²¹⁾.

Participants were recruited across the country through targeted mailing, the internet and advertisements on social media. Participants who showed interest in participating in this study were then sent the link with instructions and information about the study. Pending participants' acceptance, they were then invited to read and agree to the informed consent form presented on the first page of the online survey so as to voluntarily participate in the survey. They were informed that they could withdraw from the study at any time.

The perception of anxiety level directly related to the pandemic situation was analysed considering three different periods: (P1) the beginning of the pandemic and Portugal's first lockdown (from March to June); (P2) during the first peak, a period lasting three months (from July to September); and (P3) the subsequent deconfinement and before the implementation of the vaccination plan in Portugal (from October to December).

The present study was conducted according to the Helsinki declaration and has been previously approved by the Ethics Lab of the Universidade Católica Portuguesa. All participants provided their written informed consent before the first session of the study.

The socio-demographic data analysis was carried out using SPSS version 24.0 (IBM Corporation, Armonk, NY, USA). The parameters have been organized as mean \pm standard deviation (SD). A $p < 0.05$ was considered statistically significant.

The internal consistency of GAD was evaluated by Cronbach's Alpha. The Spearman correlation coefficient was used to assess the linear correlation between several categories (general perception, gender, anxiety level related to the pandemic situation, anxiety level related to the vaccine availability) and GAD-7 scale.

RESULTS

The main demographic characteristics of participants are reported in Table 1. A total of 921 participants were in study. The majority of participants were young adults. Pertaining to gender, the majority of the sample was female ($n= 728$; 79%). The participants' age ranged from 18 to 76 years old, with a mean age of 28.69 ± 12.26 .

About 72.1% ($n= 664$) of participants were single, 23.7% ($n= 218$) married/in a domestic partnership, 3.5% ($n= 32$) divorced/separated and 0.8% ($n= 7$) widower.

Concerning professional activity, 60.8% ($n= 560$) were students whereas 39.2% ($n= 361$) indicated having different types of professional activities. About 41.2% ($n= 379$) of participants were high school graduates, and 58.8% ($n= 542$) held a first degree. The majority of participants lived in the north of Portugal (64.6%).

Table 1 - Main demographic characteristics of the participants ($n= 921$).

	Continuous measure	Min	Max	Mean	SD
Age		18	76	28.69	12.26
	Categorical measure	%			
Gender					
Females		79.0			
Males		21.0			
Marital status					
Single		72.1			
Married/in a relationship		23.7			
Divorced/separated		3.5			
Widower		0.8			
Employment status					
Student		60.8			
Other profession		39.2			
Education levels					
Secondary		41.2			
Higher education (degree)		30.5			
Higher education (master's, doctorate and post-doc)		28.3			
Place of residence in Portugal					
North		64.6			
Centre		23.1			
Lisbon		8.7			
Alentejo		2.1			
Algarve		0.7			
Açores		0.5			
Madeira		0.3			

The participants' anxiety was reported by the analysis of the GAD-7. The internal consistency of GAD in this study was 0.93 (Cronbach's Alpha).

The perception of anxiety level directly related to the pandemic situation, during the three different periods (P1, P2, P3) showed an increase (Figure 1).

Figure 1. Portuguese participants' general reported anxiety during the pandemic outbreak.

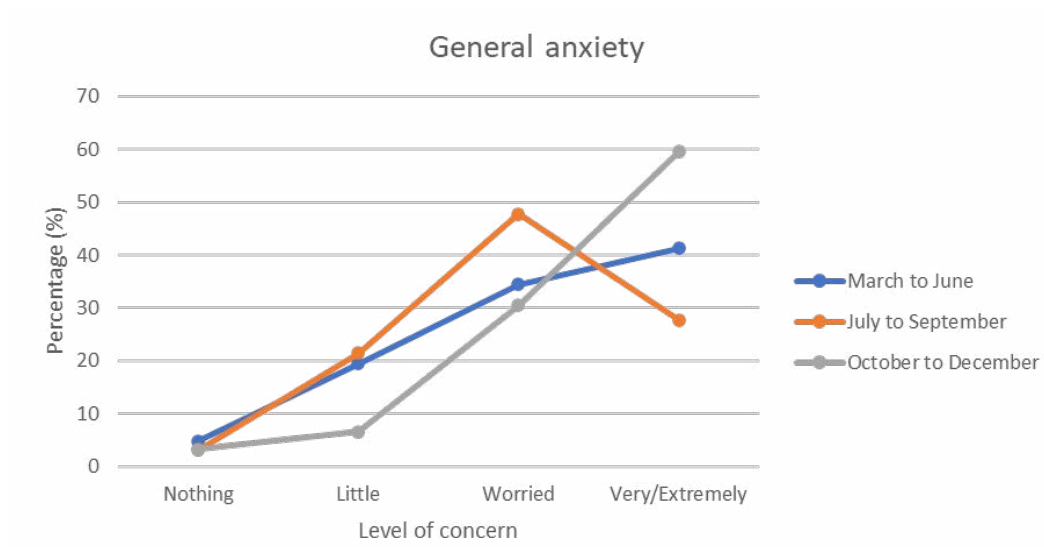


Figure 1. Portuguese participants’ general reported anxiety during the pandemic outbreak. Similar results were also obtained from the analyses about the COVID-19 vaccines-related anxiety (Figure 2).

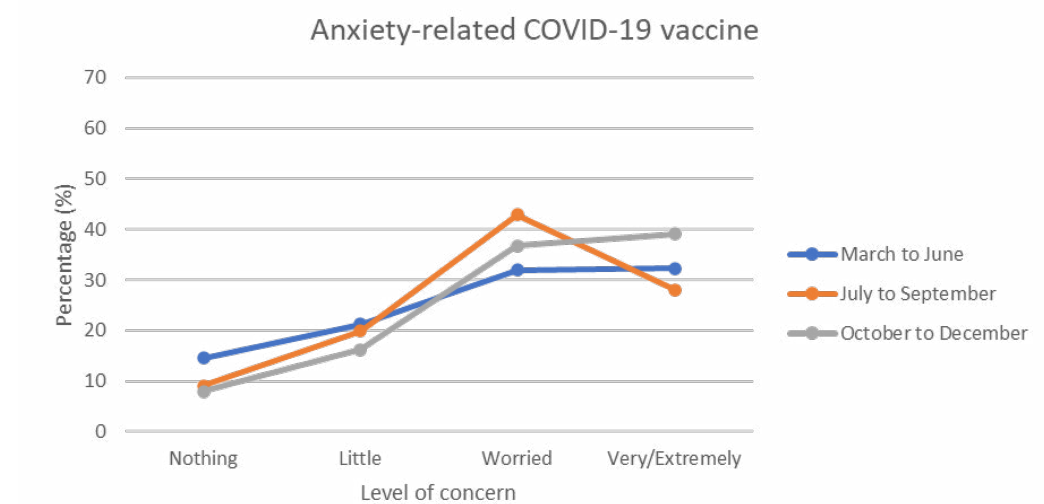


Figure 2. Portuguese participants’ COVID-19 vaccine-related anxiety during the pandemic outbreak.

The analysis of participants’ anxiety and general health perception through the Spearman test showed that the anxiety level was negative association by degree of perception, $r_s = -.11, p = <.001$ (Table 2).

Table II - Correlation analysis of GAD-7 and several categories.

		GAD-7
Spearman Correlation Coefficient	General health perception	-.116**
	Gender	-.114**
	Anxiety level related to the pandemic situation	
	P1	.186**
	P2	.327**
	P3	.414**
	Anxiety level related to the vaccine availability;	
	P1	.189**
	P2	.273**
	P3	.313**

** $p < .01, * p < .05$

According to Spearman's correlation analysis, the anxiety level (GAD-7) was positively correlated with the anxiety level related to the pandemic situation for P1, $r_s = .18$, $p = <.001$, for P2, $r_s = .32$, $p = <.001$ and in P3, $r_s = .41$, $p = <.001$ (Table 2).

Again, anxiety score (GAD-7) was positively correlated with the anxiety level related to the availability of COVID-19 vaccines, according to Spearman correlation analysis in P1, $r_s = .18$, $p = <.001$, in P2, $r_s = .27$, $p = <.001$ and in P3, $r_s = .31$, $p = <.001$ (Table 2). That is, the highest levels of anxiety are related to the nearing of the decision making regarding whether or not to take the vaccine. The data obtained showed that gender is associated with anxiety (Table 2).

DISCUSSION

Over the course of the last few months, the COVID-19 pandemic has presented an unprecedented challenge for the world's population physical and mental health. The stress underlying the lack of knowledge regarding the virus and its impact on humans, the fear of becoming severely ill, the perceived inability to cope with the mental distress, and the uncertainty about the future are some of the factors that can trigger increased anxiety across the population and influence their health-protecting behavior. Research on anxiety in general experienced by the Portuguese population during this pandemic is still scarce^(9,22). No investigation with a Portuguese sample was found regarding the relationship between anxiety and vaccination against COVID-19. Nevertheless, this issue is extremely important due to its relevance for the widespread of the COVID-19 vaccination plan and consequently public health.

The data obtained revealed that this Portuguese sample has a positive health perception. Another finding was that higher levels of health perception seemed to indicate lower associated levels of anxiety.

The data obtained through the GAD-7 showed a prevalence of mild to severe anxiety symptoms, especially in our sample which mostly comprised of students. These data are aligned with the general anxiety data in the literature. For example, a study reported that most of their sample of college students exhibited mild to severe anxiety symptoms related to the pandemic situation⁽²³⁾. Accordingly, our results also corroborate those obtained for a sample of nurses in our Portuguese population⁽²²⁾.

When analysing anxiety, it was our aim to contextualize it temporally throughout the pandemic. As stated above, we assessed three periods, and the data obtained showed that anxiety levels were moderate at the beginning of the pandemic in the country i.e., March, followed by a decrease during the months of June/July. Some possible explanations may be due to the reduction in the number of infections, data that are reported daily by the national health organisation - Direcção Geral da Saúde⁽²⁴⁾, and due to the decrease in restrictive measures recommended by the government. From October to early December, the anxiety levels increased, with values slightly higher than those at the beginning of the pandemic. It is important to report that anxiety levels over the three periods that were studied, reflected not only general anxiety but also anxiety towards the vaccine, as was possible to observe in the results obtained.

Highlighting the anxiety levels related to vaccines (during October-December), this might be due to the need to decide about accepting the vaccine shortly or not. Still, the lack of information about its effectiveness and its availability could contribute to this change. Some authors reported that literacy about COVID-19 disease seems to reduce depression and/or anxiety prevalence, as well as the dissemination of clear, transparent, and timely information⁽²¹⁾.

There was a study also focused on the correlation between vaccine hesitancy and anxiety and its results showed that high vaccine hesitancy levels were related to high anxiety levels⁽²⁵⁾. Another interesting result, despite people's adherence to vaccination was that, there is still anxiety about safety and side effects⁽²⁵⁾. The continuous action of the anti-vaccination movements and the messages they spread have invaded the social networks and their monitoring is necessary in terms of public health^(26,27). A study concluded that anxiety was associated with higher vaccine acceptance⁽²⁸⁾, however, they highlight the need to differentiate between types of fears and anxiety to predict their influence on vaccine acceptance. For these authors, to reduce vaccine hesitancy, it seems important to provide reliable information about vaccine safety, eradicate misinformation and develop risk communication strategies and promote better preventive coping with fears in this context⁽²⁸⁾.

Our data showed that the highest level of anxiety is associated with the belief of the availability of the vaccine in the near future, being higher in the months that approach the decision to take or not the vaccine (October and December). These results were aligned with the results obtained when anxiety was correlated with the perception of anxiety in the three evaluation periods, and it has been verified that in the period closest to the decision making, anxiety increases.

In this study, it was also found that gender is associated with anxiety, which is line with information reported in the literature, who highlighted that female display higher anxiety levels when compared to males⁽⁹⁾.

Thus, we can conclude through our results and those presented in the literature that psychological factors are agents that can condition and determine the success of public strategies used to control the pandemic, namely in the case of vaccination⁽⁶⁾. In this way it highlights the role of anxiety as an agent that can influence behaviors, decisions, success, and failure of adopted strategies^(6,28,29).

Therefore, it seems crucial to be familiar with the national reality, mainly to reflect on this growing anxiety in general, but also the COVID-19 vaccine-related anxiety before designing strategies that can influence the population to make an informed decision about vaccine acceptance.

The data obtained suggest the need to develop political decisions involving strategies that promote health literacy, as was reported in other studies⁽³⁰⁻³²⁾. The authorities must present a clear communication strategy for disseminating authentic public health messages and invite the population to engage in discussions, take their input seriously, and build trust through transparency⁽³¹⁾. Providing the population with accurate, evidence-based scientific data is beneficial and necessary⁽³⁰⁾. However, the same authors recommended precaution because information overload can saturate the public. The same can happen with debates with individuals and organizations, transmitted over the web/media, which can often provoke conflicting opinions and negative beliefs⁽³⁰⁾. Effective communication will allow informing the population and reduce anxiety symptoms, improve the quality of health and life of the population, and influence the decision about vaccines^(14,30,33-35).

Therefore, it is important to act as soon as possible because high anxiety levels can compromise decision-making regarding the acceptance of the vaccine and compromise the outlined political measures and the safety of all. Several strategies can be developed, such as, the development of more informative/effective vaccination campaigns, improve the encouragement to the population by more adapted and accessible messages. Hence, future studies need to address emotional aspects such as anxiety, uncertainty, or embarrassment that play a role in decision making.

Some limitations of our study should be noted. First, an online survey may lead to selection bias, as reflected in the large sample of young participants, because this group has more considerable access to social networks being easier to reach them with publicity campaigns. The knowledge, attitude, and anxiety in old people may be different from the findings of our study. Also, there was an inequality of gender, the sample being predominantly female.

In this study, the GAD-7 scale was used as this is one of the most used scales in the literature. However, in later studies a new scale could be used as the "Coronavirus Anxiety Scale" which has been recently developed and validated⁽³⁶⁾. Likewise, a longitudinal study in the future is suggested to better understand anxiety levels over time.

CONCLUSIONS

To conclude, the results of this study suggest a moderate prevalence of generalized anxiety symptoms about COVID-19 vaccines in a Portuguese sample, with a tendency to increase when approaching vaccination decision making. The anxiety levels are present not only about the COVID-19 disease but also about the vaccine's availability and efficiency. Our data draw attention to the role of psychological factors, such as the anxiety levels, that may influence the vaccine acceptance, differentiating among several types of anxiety to detect fields of intervention. Studies on this topic could help governments, policymakers, health professionals, and international organizations to target messaging around COVID-19 vaccination programs more effectively. Therefore, ensuring that the population is informed about COVID-19 vaccines could reduce unnecessary anxiety, improve behavior, health/wellbeing, and decision-making.

CONFLICTS OF INTEREST

The authors declare no conflict of interest.

AUTHOR'S CONTRIBUTIONS

Patrícia Batista contributed to the study conception and design, the acquisition, analysis, interpretation of data and writing and revision of the manuscript. **Blezi Meneses** contributed to the acquisition, analysis, interpretation of data. **Ana Beatriz-Vaz** contributed to the writing and revision of the manuscript. **Anabela Pereira** contributed to the study conception, design, writing and revision of the manuscript. **Patrícia Oliveira-Silva** contributed to the study conception, design, writing and revision of the manuscript. All authors approved the version of the manuscript to be published and are responsible for its content and integrity.

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